ALBERTA West Nile virus and wild bird surveillance: update--Sept. 1, 2003

SUMMARY:

As of September 1, a total of 1448 dead birds was received during the West Nile surveillance program implemented by the Fish and Wildlife Division of Alberta Sustainable Resource Development in 2003. The majority (98%) were corvids [no surprise, since the program was focused on corvids] and included 746 crows, and 580 magpies as well as 55 ravens, and 35 blue jays. Birds were collected over a wide geographic range throughout the province, although most birds (85%) came from the Grassland and Parkland natural regions of southern and central Alberta. All corvids were tested with the VecTest, an antigen-based screening test that was initially validated in crows and appears to work well in other corvids. Nestlings were not examined. To date (September 1, 2003), we have detected West Nile virus in 210 birds, including 101 crows, 106 magpies, and 3 blue jays from the Grassland, Parkland, and southern Boreal Forest regions. Bird testing continues until further notice. Although additional post mortems are planned, the majority of birds assessed for cause of death were determined to have died from blunt trauma.

Related news: On September 2, we detected the first positive crow from the Foothills Natural Region.

The Virus:

West Nile virus occurs in a wide geographic area throughout the world. It was first detected on the North American continent in 1999 in northeast US. To date, it has spread in migrating wild birds and local mosquitoes to encompass most of the US and southern Canada east of the Rocky Mountains. Virus activity in northern areas is limited to summer months when mosquitoes are active.

A variety of mosquito species are able to draw virus from the blood of infected individuals and pass the virus on to other individuals; however, in *Culex* spp. the virus replicates (reproduces) and thus increases its population. **Birds are the primary habitat for West Nile virus and it occurs in a wide range of bird species that show little or no clinical effect.** However, members of the corvid family (crows, magpies, ravens, jays) don't seem to be able to effectively fight the virus through their immune system—as a result, fatal infections often occur. **Mammals generally are quite resistant to infection** but rare fatal cases have been documented in horses and immuno-compromised humans (people whose immune systems do not work as well as they should).

West Nile virus can overwinter in limited numbers of dormant *Culex* spp. and year-round transmission occurs in the Gulf coast states of the southern US. The first cases of infected birds in Mexico as well as Central and South America were detected last winter.

There is little doubt that West Nile virus will establish itself throughout the New World, although the full picture in a North American context is still evolving.

Additional background material about West Nile virus in Alberta can be found on the websites of

- Alberta Health and Wellness
  http://www.health.gov.ab.ca/healthier/diseases/west_nile.html
- Alberta Agriculture, Food and Rural Development
  http://www.agric.gov.ab.ca/surveillance/west_nile_virus.html
- Fish and Wildlife Division of Alberta Sustainable Resource Development
  http://www3.gov.ab.ca/srd/fw/diseases

The Program:

Building on the successful West Nile surveillance program of 2002, representatives from four provincial agencies (Alberta Health and Wellness, Alberta Agriculture, Food and Rural Development, Alberta Environment, and Alberta Sustainable Resource Development prepared a provincial response plan for 2003 to address the potential risks posed by West Nile virus in Alberta. The plan contains two primary components: communication and surveillance. Communication occurs largely through the ***Fight the Bite*** public awareness campaign and information in departmental web pages and fact sheets (see above) as well as technical information provided directly to health care, wildlife, and veterinary professionals. The surveillance programs focus on monitoring "at risk" populations—physicians monitor human illness, veterinarians monitor horse health, and Alberta Sustainable Resource Development monitors mortality of wild corvids found dead by the public. The surveillance programs are designed to identify the presence of the virus in natural regions of the province and thereby support the needs of assessing the health risks to humans and assist Alberta Health and Wellness in providing appropriate provincial information to health care professionals and to the public.

The current report provides data only from the wild bird component of the provincial West Nile virus surveillance program. In 2003, the program focuses on crows and to a lesser extent other corvids as the primary species likely to exhibit fatal infections and thus reflect the presence or absence of the virus in Alberta populations. Fresh dead corvids collected by the public are dropped off at any Fish and Wildlife office of Alberta Sustainable Resource Development. A few additional birds of other species also are received.

Fresh or frozen birds are transported or sent to the Fish and Wildlife Division Wildlife Disease Laboratory in Edmonton. Birds are thawed and then tested with a VecTest strip. Initial positive birds were sent to the diagnostic laboratory of B.C. Agriculture in Abbotsford, B.C. for confirmatory testing with a DNA-based test called a polymerase chain reaction test (PCR).

The Data:

Species composition

Over 2000 birds have been received for West Nile testing between May 1 and September 1, 2003. Information from 1448 birds from 5 of 6 natural regions within the province was logged into the surveillance data file. The remaining birds were unsuitable for testing (dry, rotten, too young) and in the interest of efficiency, were not yet included in the file. The majority of the tested birds were corvids (98%), particularly crows and magpies (92%) (Table 1). A few ravens and blue jays were received as well as one or two individuals of various other species.

Geographic Distribution

Most of the tested birds were found in the Grassland (40%) and Parkland (45%) natural regions (Table 1) and many of them were collected in Edmonton (n=252) or Calgary (n=234) (Table 2). However, the remaining birds were collected widely throughout the area from the southern fringe of the Boreal Forest south to the US border and from the edge of the Foothills region east to the Saskatchewan border. Banff and Jasper provided a few samples from the Mountain natural region. No birds were received from the small portion of Canadian Shield in the far northeastern corner of the province.

Diagnoses

Preliminary post mortem results indicate blunt trauma as the primary cause of death for birds that were not positive for West Nile virus. Additional diagnostic evaluation is planned.

West Nile results

A total of 1416 birds was tested for West Nile virus (Table 1, 2). Two hundred and ten of these birds (15%) were POSITIVE for West Nile virus. The positive birds were collected throughout the Grassland (39%) and Parkland (47%) natural regions of central and southern Alberta and stretching northwards into the southern Boreal Forest fringe from Athabasca to Cold Lake. Viral activity was not found in the northern forests and Peace River country nor in the Foothills or Mountain natural regions. *{Author's note: one positive crow from the Foothills Natural Region was found on September 2, beyond the timeframe of this report.}*

Note that in other components of the provincial surveillance program to the end of August 2003, Alberta Environment detected West Nile virus in 23 separate pooled samples of mosquitoes collected throughout central and southern Alberta and Alberta Agriculture, Food and Rural Development received reports of 31 positive horses throughout the Parkland and Grassland natural regions plus one horse in the Boreal Natural Region at Cold Lake. The number of human cases began to rise in late August and by 2 September, 44 cases were known.

Discussion

The West Nile virus surveillance of wild birds in Alberta in 2003 is designed to detect the presence of the virus and thus the potential for risk to humans and horses in the province. In recent years, migratory birds, primarily songbirds and waterfowl, have systematically moved the virus from the Atlantic Flyway in 2000, to the Mississippi Flyway in 2001, and the Central Flyway in 2002 and 2003. This movement has resulted in a steady geographic expansion of infections in birds, horses, and humans from the northeastern US in 1999/2000, to the area east of the Mississippi River (including southern Ontario) in 2001, and the area east of the Rockies (including southern Saskatchewan, Manitoba, Ontario, Quebec as well as Nova Scotia) in 2002 and again in 2003 (to date).

Thus, there was reason to believe that spring dispersal in 2003 would return the virus to northern states and provinces including, for the first time, Alberta. Indeed this appears to be exactly what happened. The efficiency of natural systems apparently provided suitable conditions for the virus to transfer from the spring migrants and establish local populations, which were amplified (grew bigger) over time. Bird surveillance detected the first infections in early July and the virus subsequently increased in bird populations throughout the summer and eventually spilled over into horses and humans.

There were generally low numbers of mosquitoes seen in traps monitored by Alberta Environment throughout the province in 2003, including low numbers of *Culex tarsalis*, the primary transfer vehicle for this virus to move among birds and mammals. The great majority of mosquitoes collected were not *Culex* spp.

The provincial West Nile virus Response Plan is based on passive surveillance of birds found dead by the public. Callers to Fish and Wildlife offices are advised that if the dead bird is a corvid, it can be included in the West Nile surveillance program. In particular, people are encouraged to submit fresh-dead crows and magpies to any office of the Fish and Wildlife Division. Information is provided regarding appropriate precautions when handling any wild animal found dead of unknown causes. These are general precautions and do not reflect a specific health risk from handling birds dead of West Nile virus. There is no known health risk from handling individual birds that have died of West Nile virus. However, a few individuals who repeatedly handle a large number of infected birds have been infected.

No surveillance program can ever be 100% effective. However, the sensitivity of crows and magpies to West Nile virus indicates that these species are a good way to detect the potential presence of the virus and, secondarily, useful for assessing the potential risk to humans. The data to September 1, 2003 indicate that the virus currently is being transmitted throughout the entire Grassland and Parkland natural regions and the southern edge of the Boreal Forest, an area consistent with the general distribution of *Culex tarsalis* and environmental conditions suitable for the virus to maintain a summer population.

FUTURE OUTLOOK

If the pattern of dispersal holds true, there is little doubt that West Nile virus will continue to occur in southern and central regions of Alberta at low levels in birds and mosquitoes into the fall of 2003. It is probable that more cases in non-vaccinated horses and immuno-compromised humans in these regions also will occur. Although the risk to humans remains low, our data show that the virus is widespread in parts of Alberta and people should use the basic precautions outlined by Alberta Health and Wellness for avoiding mosquito bites. Information on human health risks and precautions, and surveillance data http://www.health.gov.ab.ca/healthier/diseases/west_nile.html .

The actual impact on wild populations of birds remains largely unknown. There is some tantalizing evidence of limited infections in eastern jurisdictions in 2003 that *may* indicate intense natural selection pressure to reduce the virulence of the virus in conjunction with improved resistance in birds and mosquitoes. The "hot" virus strains kill birds quickly [and perhaps, kills mosquitoes??] and thus disappear from the virus population. Similarly, highly susceptible individual birds/mosquitoes are removed and resistant individuals remain. Although we need to wait until this year's numbers are analyzed across North America, it may be that integration of the virus into North American ecosystems is well underway.

As the interest shifts away from corvids and humans, there are some preliminary indications that individuals of other bird species also die as a result of West Nile infections. Also, there is some evidence that local mortality events may occur in some of these other species, although to date, diagnostic evidence often is lacking. Wildlife management agencies are following up on indications that shrikes, raptors, and grouse species may be at some greater risk than most birds. When this involves "common" species, the impact is likely to be minimal. However, when this involves species such as loggerhead shrikes in the east and greater sage-grouse in the west, impacts are of greater concern. It is too early to tell what the consequences of such infections will be, but wildlife managers are anxious to obtain appropriate diagnostic information and act accordingly.

LONG-TERM OUTLOOK

It is readily apparent that West Nile virus could establish populations across the continent and throughout Alberta wherever suitable bird and mosquito species exist. There is a high probability that West Nile virus eventually will occur in all states and provinces from the Atlantic to the Pacific. With its ability to overwinter in some mosquito species and circulate year-round in southern states, in addition to being able to be transmitted continentally across a broad range of bird and mosquito species, the West Nile virus is unlikely to be controlled or eradicated. Fortunately, it is a relatively benign virus and the evidence to date indicates limited direct impact on wildlife. Sporadic cases in horses and humans are likely to continue but with limited overall impact. All species will have to learn to live with West Nile virus as an integral part of the North American wildlife community.

Table 1: Species and geographic distribution of corvids in the Alberta West Nile virus bird surveillance program up to September 1, 2003.
[* number outside of brackets are positive (number inside brackets is total tested)].

	Boreal	Foothills	Grassland	Mountain	Parkland	Species TOTAL
Blue Jay	0 (3)*	0	1 (13)	0	2 (19)	3 (35)
Crow	26 (94)	0 (7)	46 (296)	0 (11)	29 (338)	101 (746)
Magpie	4 (45)	0 (1)	35 (242)	0 (20)	67 (242)	106 (580)
Raven	0 (19)	0 (3)	0 (5)	0 (5)	0 (23)	0 (55)
Geographic Totals	30 (161)	0 (11)	82 (556)	0 (36)	98 (652)	210 (1416)

Table 2: Primary source of birds positive for West Nile virus in Alberta up to September 1, 2003.

Species	WNv Positives	%	Natural Region
Calgary	18 of 234	8	Grassland
Edmonton	54 of 252	21	Parkland
Greater Edm	16 of 98	16	Parkland
Medicine Hat	13 of 58	13	Grassland
Overall	210 of 1416	15	5 of 6 regions